

Skin Exfoliation

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Introduction

With so much attention focused on addressing the needs of both maturing and prematurely aged skin and the continual interest in using ingredient complexes such as hydroxy acids, retinol and other chemical and physical exfoliants, we are often asked at The International Dermal Institute to explain how these different ingredients work on the skin.

How does desquamation work? We know from our research that epidermal cells adhere to each other on the top, sides and bottoms of the cells via calcium dependent desmosomes. As the cells move upward from the deeper layers of the epidermis to the outermost layers of the stratum corneum, the desmosome attachments become weaker. This weakening action is accelerated by enzymes, found only in skin and hair follicles. These enzymes break the bonds of the desmosomes and free the cells to slough off.

What controls this desquamation process? While the exact mechanism is unknown, it is believed that cells are programmed when they are young and residing in the lower layers of the epidermis; each cell has an internal clock that ensures the cell is linked for a certain period of time and then cell cohesion decreases allowing the cells to slough off. Interestingly, the enzyme responsible for weakening the bonds is inactive in the skin until activated by another enzyme. What controls this activation process is not readily understood.

The complex process known as keratinization, commences with the birth of a new daughter cell at the basal cell layer (stratum germinativum) and its progression upward until it is shed as a stratum corneum corneocyte. This normally takes about four weeks, however, it can take as much as seventy-five days depending on age and the condition of the skin. As to be expected, younger skin is more efficient at this process of desquamation which stimulates the growth of newer cells at a deeper level. As we age the glue-like intercellular cement holding the cells together becomes denser, causing a build up in the layers of cells; cell sloughing becomes more difficult resulting in a skin that appears dull, thicker and with less tone. This may be exacerbated by environmental factors (exposure to sunlight), hormonal influences (androgens, estrogens, and epidermal growth factor) and deficiencies in various vitamins (A & D). With all of these influences effecting the desquamation process it is apparent why exfoliation is so important to the skin. Removing this build up of dead, damaged skin cells stimulates the regeneration of new cells improving the skin's appearance, feel and texture.

As professional skin therapists and consumers we have several means to affect the desquamation process. We can select to use mechanical exfoliants that help eliminate surface stratum corneum cells. Or we can choose chemical means, such as hydroxy acids to aid in exfoliation and stimulate cell renewal; in addition to hydroxy acids, enzymes from papaya (Papain) and pineapple (Bromelain) can be used along with Vitamin A (Retinol) that accelerates cell turnover. More recent studies have demonstrated that enzymes from *Bacillus ferment* (a bacteria produced enzyme) act as proteolytic agents digesting keratin protein and assisting in the exfoliation process. (For the purpose of this discussion we will only look at ingredients that affect skin exfoliation and not mechanical devices such as microdermabrasion.)

Whether you select mechanical or chemical means of exfoliation, each can be of benefit and provide substantial improvement for dry skin, acne and photodamaged skin depending on the technique and substance used. Lets look at how these different

methods of exfoliation affect the skin.

Mechanical exfoliation employs the use of either a tool (i.e. a brush, sponge) or substrate (i.e. Corn Cob Meal, Rice Bran, Date Seed Powder, Oatmeal) that loosens and reduces the outer corneocytes that comprise the stratum disjunctum layer when friction and abrasion are applied. Obviously results will vary depending on the amount of friction and the nature of the abrasive used. It is important to note that excessive abrasion can result in skin irritation so one must be careful in the type of abrasive used; for this reason The International Dermal Institute only recommends the use of abrasives that do not result in irritation, hence, we do not recommend the use of crushed fruit pits, shells or similar damaging substrates.

Chemical exfoliation utilizes chemicals, such as hydroxy acids, (i.e. Lactic Acid, Salicylic Acid, Glycolic Acid), Retinol (i.e. Vitamin A) and enzymes (i.e. Papain, Bromelain and protease enzymes from *Bacillus microbes*). While the precise mechanism of action is still being debated, there are those that believe that alpha hydroxy acids (AHAs; i.e. Lactic Acid, Glycolic Acid, Malic Acid) do not exfoliate the skin in the same conventional way that mechanical exfoliants or beta hydroxy acids (BHAs; i.e. Salicylic Acid) do. It is thought that AHAs primarily affect the skin by normalizing cell turnover in the epidermis; this stimulates the formation of normal healthy skin, which includes a sloughing of the stratum corneum, a decreased formation of dry scales on the skin's surface and stimulation of the cell cycle. While this is indeed plausible, there are some researchers that believe the mechanism of action for AHAs cannot be tied solely to stimulation of the skin as measured by traditional cell renewal techniques. Studies on cell cohesion and skin pH changes indicate that keratin bonds may be affected and that low pH levels associated with active AHA solutions may dissolve the desmosome protein linkages causing a burst in skin exfoliation. It is often said that AHAs affect the skin from the inside out because of the suggestion that they influence corneocyte cohesion at the lower layers of the Stratum corneum. The result is a thinner stratum corneum which is more flexible and compact, reflects more light and overall gives the skin a more youthful appearance.

While it is thought that both glycolic acid and lactic acid affect the skin layers in the same manner as described above, it should be noted that there are additional beneficial effects unique to lactic acid. These include an increase in dermal Glycosaminoglycans (GAGs- natural moisturizers), an increase in ceramides (epidermal barrier lipids) and improved water barrier properties. Glycolic acid does however, share with lactic acid the beneficial effect of stimulating collagen synthesis. It has been speculated that this latter effect may be the result of irritation resulting in a natural stimulation of new collagen. Surprisingly, there are no published reports that the BHA, salicylic acid, stimulates the formation of collagen like the AHAs.

Unlike Lactic Acid, Salicylic Acid does not hydrate the skin nor does it help to normalize epidermal anatomy or physiology. Salicylic Acid, primarily a keratolytic agent, dissolves the stratum corneum (SC) layer-by-layer from the outside in, resulting in a thinning of the SC. It has been demonstrated to affect hyperpigmentation but only when used at very high concentrations (50%). And unlike AHAs, salicylic acid affects the arachidonic acid cascade and exhibits anti-inflammatory properties, making Salicylic acid products seem less irritating than glycolic acid, even though they are more powerful. The anti-inflammatory effects of salicylic acid make it a preferred option for clients with acne and rosacea.

Salicylic acid also differs from AHAs due to its lipophilic nature which enables it to penetrate sebaceous substances in the hair follicle and exfoliate the pores. AHAs being water soluble are not as effective. In studies comparing a 2% salicylic acid solution vs. a 8% glycolic acid solution, the salicylic acid significantly decreased the density of microcomedones, whereas, the glycolic acid solution did not. Because Salicylic acid has a much stronger

comedolytic effect than AHAs on the skin I would highly recommend salicylic acid containing products when treating clients with acne.

While the precise mechanism of action of hydroxy acids is still open to debate, there is a general consensus that exfoliating the outermost layers of the stratum corneum (the stratum disjunctum) results in improved skin texture, and a reduction in fine lines and hyperpigmentation. Recent studies have demonstrated that a 5% Lactic acid solution not only stimulated stratum corneum sloughing but increased skin hydration and helped to reduce hyperpigmentation. Studies done by Walter Smith Ph.D comparing efficacy of a 4% Glycolic acid solution vs a 4% Lactic Acid solution (both at a pH of 3) indicate that Lactic acid was not only less irritating but slightly more effective than glycolic acid in stimulating cell turnover. Interestingly, a 4% solution of Salicylic acid was superior to both of the alpha hydroxy acids.

One final note on the use of alpha hydroxy acids. For safe use of glycolic and lactic acid it is advisable to follow the CIR suggestions (endorsed by EMDA) that indicate consumers should not use products above 10% or below a pH of 3.5; for professional use, the limits are extended to 30% and the lowest advisable pH is 3.0. In addition, if you are prescribing hydroxy acid products to your clients it is imperative that you advise them that the use of hydroxy acids can make skin more sensitive to sunlight. Always recommend they use at least a SPF 15. It is only a matter of time until a sun alert warning will be required for all AHA products.

In recent years, Retinol (Vitamin A) has been included in exfoliation formulas because the skin can convert Retinol to Retinoic Acid, a potent skin exfoliation agent and antiaging agent. Retinol has been shown to improve the visible signs of photoaging as well as normal chronological aging when used on a daily basis. Studies conducted by Drs. Kang and Voorhees at the University of Michigan department of dermatology indicate that retinol mimicked the activity of retinoic acid in stimulating a thickening of the epidermis but without the irritation often seen with retinoic acid. Further studies also showed that retinol slowed collagen degradation when skin was exposed to sunlight, an observation attributed to the ability of retinol to inhibit enzymes such as collagenase that are responsible for degradation of collagen.

Biological enzymes such as Papain (from papaya) and Bromelain (from pineapple) stimulate exfoliation by digesting intercorneocyte cohesion chemically; these proteolytic enzymes decompose proteins into smaller fragments causing a softening effect to the skin and a sloughing of corneocytes. Unlike AHAs their activity is not pH dependent but is activated by water and limited in the amount of exfoliation that can be achieved.

Recently studies on still another enzyme, the protease enzyme from the microorganism *Bacillus subtilis*, have demonstrated that this enzyme extract is a beneficial keratolytic agent that helps eliminate desquamating corneocytes when applied topically.

Other ingredients may be used to assist in exfoliation including rice extract and rice bran. While the nutritional value of rice (*Oryza Sativa*) is well known, less obvious are the medicinal and cosmetic applications of this historical grain. Rice seeds and bran have been used for thousands of years to relieve inflammation associated with skin diseases and for cleansing and softening the skin. Traditionally women in Japan have rubbed Rice Bran on their face keep to skin smooth and bright. Not limited to a beauty regimen of the upper class, women rice farmers used the water left over from washing white rice to bathe in and wash their face for the same reasons-smooth, luminous looking skin. What do we attribute these benefits to? Chemical analysis of Rice Bran (the outer layer on brown rice) indicates it is a rich source of biologically active agents that are beneficial to the skin. These include Phytic Acid, gamma oryzanol and other important plant actives. Studies have shown that Rice Bran contains 10% Phytic Acid (AKA myo-inositol, a B complex vitamin) which chelates or binds calcium ions, helping to loosen cell cohesion and promote corneocyte sloughing.

Phytic Acid also chelates copper, thereby, inhibiting tyrosinase in melanogenesis and controlling hyperpigmentation. It also increases peripheral blood flow to the skin. Gamma Oryzanol, a derivative of Vitamin B, is also known as a Ferulic Acid Ester. It provides enhanced antioxidant protection when complexed with amino acids found in rice extract and rice starch. It softens skin and provides anti-itch properties. In addition, Oryzanol may impede melanogenesis by inhibiting tyrosinase. What's more, Rice bran contains Tocopherols (antioxidant Vitamin E that protect against free radicals; Proanthocyanidins (anti-enzyme inhibitors of collagenase, elastase and hyaluronidase) and other Enzymes (i.e. Super oxide dismutase, SOD).

Regardless of which type of exfoliant you select to use on your client, you should always complete a Consultation card to assess what products they may be using at home, if they are using any prescription medications that will seriously alter their skin physiology and the frequency of use of these products. There is a valid concern that clients at home may be over-exfoliating their skin. In their quest to achieve that radiant, healthy looking complexion, consumers often will double up on their at-home exfoliation treatments and even use exfoliants from different manufacturers on alternate days. Unfortunately consumers tend to subscribe to the erroneous belief that "if a little is good, more must be better". With repeated over-exfoliation, the inevitable result will be to diminish the skin's natural barrier function thereby contributing to a potentially sensitized skin condition and ultimately dehydration. Tell-tale signs of over-exfoliated skin include: noticeable dehydration, patchy areas of dryness, skin tautness, a transparent looking epidermis, redness or couperose condition, broken capillaries, itchiness, increased sensitivity, inflammatory acne and irritation.

As we focus on the benefits of exfoliation, we will see more refined methods of assisting with the desquamation of corneocytes. Our goal as scientists and professional skin therapists at The International Dermal Institute is to continue to research new ingredient complexes that help us to achieve the benefits of exfoliation while maintaining optimum skin fitness and health.

Before You Exfoliate:

- The Client Consultation System is a very useful component of every treatment, and is especially important whenever any form of exfoliation is to be performed. All clients should complete a Consultation Card prior to product application.
- If the client is using Retin-A, Renova, Adapalene or any other exfoliating product, they must discontinue use at least two weeks before undergoing any exfoliation.
- Clients who are taking Accutane, or have taken Accutane within the past six months, should not receive any form of exfoliation treatments.
- Do not perform any type of exfoliation on sunburned or

irritated skin, or on skin that has been waxed within the past 24 hours.

- Always recommend that the client use a sunscreen with a minimum SPF 15 whenever going outdoors.

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